

PATENT ABSTRACTS OF JAPAN

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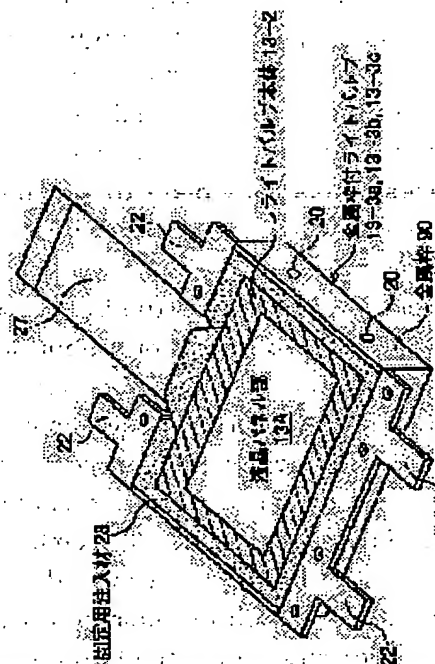
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(54) PROJECTOR DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an inexpensive projector device by which deviation in the position of an LCD light valve due to a plastic resin frame is prevented by making a frame made of a plastic resin fixing the light valve main body of a liquid crystal display part as a metal frame and the miniaturization of a prism is attained.

SOLUTION: This is a projector device which is provided with liquid crystal display parts 13-3a, 13-3b and 13-3c fixed at an optical member so as to optically modulate light from a light source based on a signal and by which an image is formed by projecting the light modulated by the liquid crystal display parts 13-3a, 13-3b and 13-3c to an object, and the liquid crystal display parts 13-3a, 13-3b and 13-3c are provided with a liquid crystal panel part 13A optically modulating the light from the light source based on the signal and the frame 90 made of a metal holding the liquid crystal panel part 13A and directly fixed to the optical member.



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CLAIMS

[Claim(s)]

[Claim 1] It has the liquid crystal display section fixed to the optical member in order to carry out light modulation of the light from the light source based on a signal. It is projector equipment for projecting the light modulated by said liquid crystal display section on an object, and forming an image. Said liquid crystal display section Projector equipment characterized by having the liquid crystal panel section which carries out light modulation of the light from said light source based on a signal, and the metal frame which holds said liquid crystal panel section and is fixed to said optical member side.

[Claim 2] Projector equipment according to claim 1 which meets said liquid crystal panel section and fixes a polarizing plate to said metal frame directly.

[Claim 3] Said liquid crystal display section is projector equipment according to claim 1 which is the prism block with which it is arranged corresponding to red, blue, and green, respectively, and said optical member compounds the light modulated by each green liquid crystal display section with red and blue.

[Claim 4] Projector equipment according to claim 1 by which the metal holddown member is arranged and said some of metal frames are connected to said optical member to said holddown member.

[Claim 5] It is projector equipment according to claim 4 to which the projection part is prepared in said holddown member, the projection part is prepared also in said metal frame, and said projection part of said holddown member and said projection part of said metal frame are connected.

[Claim 6] Said holddown member is the 1st page of said optical member, and projector equipment according to claim 5 arranged at said 2nd page with the 1st opposite page, respectively.

[Claim 7] Projector equipment according to claim 5 to which said projection part of said holddown member and said projection part of said metal frame are connected by solder.

[Claim 8] Said metal frame is projector equipment according to claim 1 which fabricates a metallic thin plate and is made.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention is equipped with the liquid crystal display section fixed to the optical member in order to carry out light modulation of the light from the light source based on a signal, and it relates to the projector equipment for projecting the light modulated by the liquid crystal display section on an object, and forming an image.

[0002]

[Description of the Prior Art] This kind of projector equipment has the light source, a LCD light valve (liquid crystal display section), a projector lens, a dichroic mirror and a reflective mirror, cross prism, a projection screen, etc., and devices various to the fixed approach of a LCD light valve and the method of taking the registration (alignment) of the light valve of three sheets in 3 plate methods etc. are made. Drawing 11 - drawing 14 show the projector equipment equipped with the liquid crystal display section as a conventional light valve. Drawing 11 is the front view of conventional projector equipment, drawing 12 shows the LCD light valves (liquid crystal display section) 113a, 113b, and 113c in drawing 11, drawing 13 is the top view showing the cross prism 15, red, a blue and green LCD light valve, and projector lens 16 grade, and drawing 14 shows the structure which fixes the LCD light valves 113a, 113b, and 113c to the cross prism 115.

[0003] Although drawing 11 shows the part of the optical unit of liquid crystal projector equipment, illustration of the whole equipment is omitted. First, the outline of an optical unit is explained. The optical unit consists of the unit case lower part and the unit case upper part, and *****, such as a dichroic mirror, a light valve, and color composition prism, are arranged in the unit case 117. Ultraviolet rays and infrared radiation are cut with UV and the IR filter 102, and, as for the light from a lamp 101, the transmitted light goes into the Maine condenser lens 105 through the first fly eye lens 103 and the 2nd fly eye lens 104. Color separation is carried out with the first dichroic mirror 106, the light of R (red) is reflected here, and the light of G and B (green, blue) penetrates the light which came out of the Maine condenser lens 105.

[0004] It reflects by high reflection factor mirror 108a, and is condensed by condenser-lens 109a, the oscillatory wave of an one direction (P wave transparency) is chosen by polarizing plate 112a, it goes into LCD light valve 113a for R (red), red penetrates based on a video signal, color composition is carried out with other colors by the cross prism 115, and it is projected on R light reflected with the first dichroic mirror 106 by the projection screen with a projector lens 116.

[0005] As for the light (G, B) which penetrated the first dichroic mirror 106, color separation of the light of G (green) is carried out by reflection and transparency of the light of B (blue) with the second dichroic mirror 107. G colored light reflected with the second dichroic mirror 107 it condenses by condenser-lens 109b — having — polarizing plate 112b (a P wave —) The oscillatory wave of the direction of permeated water Taira oscillating one direction is chosen, go into LCD light valve 113b for G colors (green), and green penetrates based on a video signal like the light of G color. It goes into the cross prism 115, color composition is carried out with other colors, and it is projected by the projection screen with a projector lens 116.

[0006] The light of B (blue) which penetrated the second dichroic mirror 107 Reflect by high reflection factor mirror 108b through the first relay lens 110, and it reflects by rate mirror of light reflex 108c further through the second relay lens 111, it condenses by condenser-lens 109c — having — polarizing plate 112c (a P wave —) The oscillatory wave of the direction of permeated water Taira oscillating one direction is chosen, go into LCD light valve 113c for B (blue), and blue penetrates based on a video signal like the light of R and G. It goes into the cross prism 115, color composition is carried out with other colors, and it is projected by the projection screen with a projector lens 116.

[0007] Drawing 12 shows the condition that the LCD light valves 113a, 113b, and 113c were assembled, and drawing 13 shows the condition that the fixed metallic ornaments 114a, 114b, and 114c, and light valves 113a, 113b, and 113c and a polarizing plate 112 were assembled to the cross prism 115. Drawing

14 shows the condition that a light valve is assembled to fixed metallic-ornaments 114b of the cross prism 115. In drawing 12, the light valve body 113-2 made from plastics appears to fixing metal 113-1, and polarizing plate 112a (112b, 112c) is further carried to this light valve body 113-2. And these polarizing plates, a light valve, and fixing metal are fixing the twist to **** 113-3 by the bundle.

[0008] In drawing 13, the fixed metallic ornaments 114a, 114b, and 114c are being fixed by adhesion to the cross prism 115. As shown in these fixed metallic ornaments 114a, 114b, and 114c at drawing 14, projection partial 114a-1 is formed. The projection part 113-4 is formed in fixing metal 113-1. This projection part 113-4 is put together to projection partial 114a-1 of the location where the fixed metallic ornaments 114a, 114b, and 114c correspond, and is fixed with solder etc. Thus, light valves 113a, 113b, and 113c and polarizing plates 112a, 112b, and 112c are attached to prism 115. after a fixture or an exclusive machine performs alignment of each light valves 113a, 113b, and 113c so that R (red) and B (blue) may be alike on the basis of the light valve of G (green), respectively and a green image may lap in performing this installation, it will fix with solder etc.

[0009]

[Problem(s) to be Solved by the Invention] In the conventional projector equipment mentioned above, it had the following problems by the alignment (registration) of the fixed approach of 113a, 113b, and a 113c light valve, and the light valve of three plates.

(1) The light valve body 113-2 of the LCD light valves 113a, 113b, and 113c of drawing 12 was a plastics resin frame, since the metal components of LCD fixing-metal 113-1 grade were needed when it fixes to the cross prism side fixed metallic ornaments 114 with solder etc., components mark increased and product cost was high mostly [the number of erectors].

(2) since a polarizing plate 112 and the LCD light valves 113a, 113b, and 113c are ****ed and it is ***** (ing) by 113-3, if a blemish tends to be attached to polarizing plates 112a, 112b, and 112c or it is going to exchange polarizing plates by breakage of glass etc. — a LCD light valve — together — picking — **** — since it becomes things, since a LCD light valve causes a location gap, it has complicatedness, such as soldering by performing alignment again.

[0010] (3) Since the LCD light valves 113a, 113b, and 113c were ****ed to the LCD fixing metal 113-1 and it was fixing by 113-3, it had become the cause by which **** loosened with vibration, an impact, etc. in a long time, and a location gap of a LCD light valve was caused.

(4) Since it had become the structure which fixes the fixed metallic ornaments 114 to the front face of prism of the cross prism 115 by adhesion, there was a problem that prism had to be enlarged. This invention offers the cheap projector equipment which can solve various problems resulting from a plastics resin frame mentioned above by using as a metal frame the frame made of plastic resin which is fixing the light valve body of a LCD light valve.

[0011]

[Means for Solving the Problem] It has the liquid crystal display section fixed to the optical member in order that invention of claim 1 might carry out light modulation of the light from the light source based on a signal. It is projector equipment for projecting the light modulated by said liquid crystal display section on an object, and forming an image. Said liquid crystal display section It is projector equipment characterized by having the liquid crystal panel section which carries out light modulation of the light from said light source based on a signal, and the metal frame which holds said liquid crystal panel section and is fixed to said optical member side. Thereby, since a metal frame holds the liquid crystal panel section, the effectiveness which radiates heat can go up the heat which the liquid crystal display section generates, and the temperature rise of the liquid crystal display section can be made quiet. Although both the frame made from plastics and the metal frame were required of the former, since the frame made from plastics is unnecessary, components mark are reduced and product cost can be reduced.

[0012] In projector equipment according to claim 1, invention of claim 2 meets said liquid crystal panel section, and fixes a polarizing plate to said metal frame directly. While being able to meet the liquid

crystal panel section and being able to fix a polarizing plate easily by this, exchange of a polarizing plate is easy. That is, since it becomes unnecessary to ***** a light valve, a polarizing plate, etc. like before, the exchange is easy.

[0013] In projector equipment according to claim 1, said liquid crystal display section is arranged corresponding to red, blue, and green, respectively, and said optical member of invention of claim 3 is a prism block with which the light modulated by red, blue, and each green liquid crystal display section is compounded. Thereby, alignment (registration) of red and each blue and green liquid crystal display section can be performed correctly and easily by fixing red and each blue and green liquid crystal display section using a metal frame to an optical member.

[0014] In projector equipment according to claim 1, since some metal frames can connect electrically to the holddown member by the side of an optical member, invention of claim 4 can perform positioning to the optical member of a metal frame easily easily [connection / electric].

[0015] In projector equipment according to claim 4, the projection part is prepared in said holddown member, as for invention of claim 5, the projection part is prepared also at said metal frame, and said projection part of said holddown member and said projection part of said metal frame are connected. Both electric connection and positioning to the optical member of a metal frame can be performed only by connecting electrically the projection part of a metal holddown member, and the projection part of a metal frame.

[0016] In projector equipment according to claim 5, said holddown member is arranged for invention of claim 6 at the 1st page of said optical member, and said 2nd page with the 1st opposite page, respectively. Since an optical effective area used for the incidence and outgoing radiation of light in prism since an optical member is out of range and it can fix by doing in this way when it fixes a metal frame to a holddown member does not decrease, the miniaturization of prism can be attained in order to secure a certain effective area, if it says conversely.

[0017] In projector equipment according to claim 5, as for invention of claim 7, said projection part of said holddown member and said projection part of said metal frame are connected by solder. Thereby, electric connection of the projection part of a holddown member and the projection part of a metal frame can be easily made using solder.

[0018] Invention of claim 8 fabricates a metallic thin plate in projector equipment according to claim 1, and said metal frame is made. Heat can be radiated certainly and easily in the heat which the liquid crystal display section emits by this.

[0019] [Embodiment of the Invention] Hereafter, the gestalt of suitable operation of this invention is explained to a detail based on an accompanying drawing. In addition, since the gestalt of the operation described below is the suitable example of this invention, desirable various limitation is attached technically, but especially the range of this invention is not restricted to these gestalten, as long as there is no publication of the purport which limits this invention in the following explanation.

[0020] Drawing 1 shows the tooth-back mold magnifying device as an example equipped with the projector equipment of this invention. This tooth-back mold magnifying device 95 is equipped with a body 97, a mirror 99, the projection screen 96, and projector equipment 98. It reflects by the mirror 99, and the light L on which it is projected from projector equipment 98 expands the tooth-back side of a screen 96, and is displayed. An observer 94 can observe the image displayed on this screen 96 from a transverse-plane side. This projector equipment 98 can display the image of a color, and is equipped with optical system as shown in drawing 2. This projector equipment 98 is liquid crystal projector equipment of 3 plate type corresponding to so-called R and G, and B, and drawing 1 shows the part of the optical unit of this projector equipment. However, illustration of the part around [the] equipment and an optical unit case is omitted. The unit case of this optical unit consists of the unit case lower part and the unit case upper part (not shown), and optics, such as a dichroic mirror, three light valves, and cross prism, are arranged in the unit case.

[0021] As for the light from a lamp 1, ultraviolet rays and infrared radiation are cut with UV (ultraviolet rays) and the IR (infrared radiation) filter 2, and the transmitted light reflects the S wave component which went into the deviation sensing element 18 through the first fly eye lens 3, and was separated by PBS (deviation beam splitter), rotates to an optical axis in parallel by the next mirror, rotates 90 degrees with a wavelength plate, and it is changed into a P wave. The P wave to which the light which passed along the deviation sensing element 18 penetrated PBS goes into the Maine condenser lens 5 through the second fly eye lens 4. Color separation is carried out with the first dichroic mirror 6, the light of B (blue) is reflected here, and the light of R and G (red, green) penetrates the light which came out of the Maine condenser lens 5.

[0022] It reflects by high reflection factor mirror 8a, and is condensed by condenser-lens 9a, and the oscillatory wave of an one direction (P wave transparency) is chosen by polarizing plate 12a, it goes into LCD light valve 13-3a for B (blue), a blue light penetrates based on a video signal, color composition is carried out with other colors by the L type prism 19, and it is projected on the light of B reflected with the first dichroic mirror 6 by the projection screen with a projector lens 16.

[0023] With the second dichroic mirror 7, the light of reflection and G (green) penetrates [the light of R (red)] the light (R, G) which penetrated the first dichroic mirror 6, and color separation is carried out. The light of R reflected with the second dichroic mirror 7 It is condensed by condenser-lens 9b, and the oscillatory wave of an one direction (a P wave, the direction vibration of permeated water Taira) is chosen by polarizing plate 12b. It goes into LCD light valve 13-3b for R (red), and based on a video signal, red penetrates like the light of B, it goes into the L type prism 19, color composition is carried out with other colors, and it is projected by the projection screen with a projector lens 16.

[0024] The light (green) of G which penetrated the second dichroic mirror 7 It reflects by high reflection factor mirror 8b through the first relay lens 10, and passes along the second relay lens 11. Further It is reflected by rate mirror of light reflex 8c, and is condensed by condenser-lens 9c. The oscillatory wave of an one direction (a P wave, the direction vibration of permeated water Taira) is chosen by polarizing plate 12c, go into LCD light valve 13-3c for G (green), and green penetrates based on a video signal like the light of B and G. It goes into the L type prism 19, color composition is carried out with other colors, and it is projected by the projection screen with a projector lens 16.

[0025] Drawing 3 shows the example of structure of LCD light valve 13-3a the polarizing plates 12a, 12b, and 12c mentioned above and with a metal frame, 13-3b, and 13-3c. Light valve 13-3a with a metal frame, 13-3b, and 13-3c have the same structure, and are equipped with the metal frame 90, respectively. It ***** to this metal frame 90, and polarizing plates 12a, 12b, and 12c are being fixed using 89, respectively. Drawing 4 and drawing 5 show an example of the light valve body 13-2 with which the light valves 13a, 13b, and 13c with the metal frame of drawing 3 are equipped. The light valve body 13-2 has liquid crystal panel section 13A and the lead section 27. Liquid crystal panel section 13A can send the video signal of arbitration through the lead section 27 from video-signal feed zone 13B. The rectangle-like thing which has a predetermined aspect ratio can be used for liquid crystal panel section 13A. Liquid crystal panel section 13A shown in drawing 4 and drawing 5 will be in an insertion condition like drawing 7 by being inserted into the metal frame 90 shown in drawing 6.

[0026] The metal frame 90 shown in drawing 6 is equipped with the projection parts (solder cost) 22 of the crevice 88 for receipt, and 87 or 4 openings, and four positioning dowels 20. In the crevice 88 for receipt, liquid crystal panel section 13A shown in drawing 4 is contained. And the lead section 27 is inserted in another opening 86. It will be in the receipt condition of liquid crystal panel section 13A as this shows to drawing 7. Thus, when containing, liquid crystal panel section 13A is supported by four positioning dowels 20. And liquid crystal panel section 13A is expressed from opening 87. Two projection parts 22 and 22 have projected a projection and the two remaining projection parts 22 in parallel from another side of the metal frame 90 from the one side of the metal frame 90. The metal frame 90 is made from the metal ingredient which is excellent in conductivity, for example, the thickness is made from the very thin plate around 0.8mm. By doing in this way, while being able to make the heat emitted when

liquid crystal panel section 13A operates radiate heat efficiently, lightweight-ization can be attained. As the quality of the material for making the metal frame 90, it is Permanent. alloy (alloy of common-name Permalloy permalloy PB:nickel and Fe) or SUS304 grade ** (stainless-steel plate) is employable. In addition, a hole 21 is a hole in the case of ****ing polarizing plates 12a, 12b, and 12c to the metal frame 90, and fixing using 89, as shown in drawing 3 .

[0027] In drawing 7 , liquid crystal panel section 13A of a light valve body is already inserted in into the metal frame 90, and the location is held by the positioning dowel 20 shown in drawing 6 . And the impregnation material 28 for immobilization is slushed into the whole clearance between the metal frame 90 and liquid crystal panel section 13A, i.e., a perimeter, and the metal frame 90 and liquid crystal panel section 13A are fixed firmly. as this impregnation material 28 for immobilization — RTV (Room Temperature Vulcanizing:silicone 1 liquid type RTV rubber (silicone 1 liquid type R tee buoy rubber) — in the property of this RTV rubber; it reacts with the moisture in air, hardens at a room temperature, and becomes a rubber elasticity object.) moreover, silicone 2 liquid type RTV rubber — base resin and a curing agent — specified quantity mixing — carrying out — a room temperature — or it is made to heat and harden RTV of this 1 liquid type and a 2 liquid type can be used as an object for *****. And light valve 13-3a with a metal frame shown in drawing 8 and drawing 3 , 13-3b, and 13-3c are completed by inserting in a match plate 26 to the metal frame 90 of the condition of drawing 7 , as shown in drawing 8 . In this case, the match plate 26 of drawing 8 is positioned and fixed using the positioning dowel 20.

[0028] Drawing 9 shows the physical relationship of the LCD fixed metallic-ornaments upper part 30 and the LCD fixed metallic-ornaments lower part 31 to three light valve 13-3a, 13-3b, 13-3c, prism 19 and a projector lens 16, and lists.

[0029] Drawing 10 shows the physical relationship of light valve 13-3a the LCD fixed metallic-ornaments upper part 30 and the LCD fixed metallic-ornaments lower part 31, the L type prism (prism block) 19, and with a metal frame, and polarizing plate 12a. The LCD fixed metallic-ornaments upper part 30 and the LCD fixed metallic-ornaments lower part 31 are fixed by adhesion to 1st page 19A and 2nd page 19B of the L type prism 19, for example, respectively. The fixed metallic-ornaments upper part 30 and the fixed metallic-ornaments lower part 31 have the respectively almost same configuration and magnitude as the L type prism 19. 19A and page [1st] 19B are the field [which does not participate in incidence or outgoing radiation of light of L type prism 19] sides which meet.

[0030] The fixed metallic-ornaments upper part 30 and the fixed metallic-ornaments lower part 31 are made from the metal of conductive outstanding sheet metal, are the thing of the same quality of the material as the metal frame 90, can be made, and serve as a bilateral symmetry configuration. The fixed metallic-ornaments upper part 30 has six projection parts 33, 34, and 35. The fixed metallic-ornaments lower part 31 has six projection parts 33, 34, and 35 similarly. The projection parts 33 of each fixed metallic-ornaments upper part 30 and the fixed metallic-ornaments lower part 31 are joined to the projection part 22 of light valve 13-3a with a metal frame with solder etc. Thereby, positioning to the L type prism 19 of light valve 13 with metal frame-3a can be ensured.

[0031] In the same way, the projection part 22 of light valve 13-3b is positioned into the projection parts 35 of the fixed metallic-ornaments upper part 30 and the fixed metallic-ornaments lower part 31 with solder etc., respectively, and is fixed to them. The projection part 22 of light valve 13-3c is similarly fixed with solder etc. to the projection parts 34 of the fixed metallic-ornaments upper part 30 and the fixed metallic-ornaments lower part 31. The physical relationship of such light valve 13-3a, 13-3b, and 13-3c It is based on light valve 13-3b for red. The image of light valve 13-3a for [other] blue, and light valve 13-3c for green After a fixture or an exclusive machine adjusting and performing alignment (registration) so that it may lay on top of the image of light valve 13-3b for red, it fixes by soldering of each projection part. An automaton performs soldering processing etc.

[0032] Although drawing 10 shows signs that light valve 13-3a for blue is fixed with solder to the fixed metallic-ornaments upper part 30 and the fixed metallic-ornaments lower part 31, illustration is omitted if attached to immobilization of other two light valve 13-3b and 13-3c. In addition, the L type prism 19

will be fixed to the optical unit case lower part which is not illustrated using a part of fixed metallic-ornaments lower part 31. Different L type prism 19 from a conventional type lowers the cost of prism, and a deviation sensing element is for gathering the use effectiveness of a lamp. Moreover, arrangement of each light valve differs in order to aim at improvement in a color.

[0033] By the way, this invention is not limited to the gestalt of the above-mentioned implementation, and modification of it is variously possible in the range which does not deviate from the range of this invention. For example, with the gestalt of implementation of illustration, although the example of the so-called liquid crystal projector equipment of 3 plate type is shown, this invention is applicable not only to this but the so-called veneer-type liquid crystal projector equipment. With this veneer type liquid crystal projector equipment, a colour picture display or monochrome graphic display is performed using the light valve of one sheet not using the light valve of three sheets.

[0034] With the gestalt of operation of this invention, the following effectiveness is acquired by using a LCD light valve frame as a metal frame from plastic resin.

(1) By making the frame of a LCD light valve into metal, since the metal frame was soldered to direct prism side fixed metallic ornaments, reduction of components mark of it was completed. Moreover, reduction of cost was completed because assembly became [that components were reducible and] easy.

(2) Moreover, by fixing a direct polarizing plate to a metal frame, it comes to be able to perform installation removal of a polarizing plate independently, and the readjustment by location gap of a light valve became unnecessary.

(3) Since it is not necessary to fix a LCD light valve by ****, it is strong against vibration or an impact and R by the slack of ****, G, and a location gap of a B3 sheet light valve do not take place.

(Registration gap)

(4) Since it is not necessary to take the large effective (image surface) side of prism when prism fixes prism side fixed metallic ornaments up and down, prism can be made small.

[0035] It can be made to carry out by using the conventional plastic frame of a LCD light valve as a metal frame like this invention direct solder fixing of the light valve. Moreover, polarizing plates can be easily exchanged, as it can fix to a metal frame independently.

[0036] With the gestalt of operation of this invention, it has the light source, a LCD light valve, a projector lens, a dichroic mirror and a reflective mirror, prism, a projection screen, etc., the light from the light source is irradiated at a LCD light valve, the transmitted light is projected on a screen with a projector lens, and the LCD light valve is being fixed to the metal frame in the projector equipment which displays an image. The metal frame's having it, as solder fixing can do a frame, and a metal frame and the projection parts of the LCD fixed metallic-ornaments upper part and the lower part have played a role of solder cost: [made of the thin metal of board thickness]

[0037] Although a LCD light valve has R, G, and a B3 sheet light valve by 3 plate methods, the LCD light valve with a metal frame is using the common LCD fixed metallic-ornaments upper part, the lower part, and the projection part by the side of prism, and the registration between light valves of R, G, and B tends to obtain it. Moreover, the heat dissipation effectiveness from a LCD light valve goes up by the thing which can attach a direct polarizing plate in a metal frame and to carry out to a metal frame, and the temperature rise of a light valve can be made loose. Prism can be miniaturized securing effective area compared with the former, when it was not interfered by the fixed metallic-ornaments upper part and the lower part but the effective area of the field which uses the fixed metallic ornaments by the side of prism for the incidence and outgoing radiation of light of prism by arranging to the prism upper and lower sides was said conversely.

[0038] Although built in the tooth-back mold magnifying device, of course, the gestalt of implementation of illustration is available for it, even if the projector equipment of this invention is a thing of a format which projects not only this but the incident light from projector equipment on the screen formed in the wall etc.

[0039]

[Effect of the Invention] As explained above, according to this invention, the cheap projector equipment which can solve various problems resulting from a plastics resin frame mentioned above by using as a metal frame the frame made of plastic resin which is fixing the light valve body of a LCD light valve can be offered.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] Drawing showing an example of the tooth-back mold magnifying device with which the projector equipment of this invention is applied.

[Drawing 2] Drawing showing the optical system of the projector equipment of drawing 1.

[Drawing 3] The perspective view showing the gestalt of desirable operation of the light valve with a metal frame of drawing 2.

[Drawing 4] The front view showing the light valve body with a metal frame of drawing 3.

[Drawing 5] The side elevation of a light valve body.

[Drawing 6] The perspective view showing the metal frame for inserting in a light valve body.

[Drawing 7] Drawing showing the condition that the light valve body was inserted in and fixed to the metal frame.

[Drawing 8] Drawing showing the condition of having attached the match plate further to the metal frame of drawing 7.

[Drawing 9] Drawing showing the physical relationship of three light valves, prism and a projector lens, the LCD fixed metallic-ornaments upper part, and the LCD fixed metallic-ornaments lower part.

[Drawing 10] The perspective view showing the physical relationship and structure of the LCD fixed metallic-ornaments upper part, the LCD fixed metallic-ornaments lower part, prism, and a light valve.

[Drawing 11] Drawing showing the optical system of conventional projector equipment.

[Drawing 12] The perspective view showing the example of structure of the conventional light valve of drawing 11.

[Drawing 13] The top view showing the physical relationship of the conventional prism, a light valve, and a projector lens.

[Drawing 14] The perspective view showing the installation relation between the conventional light valve and prism.

[Description of Notations]

12a, 12b, 12c [... A video-signal feed zone, 19 / ... Prism (optical member) 22 / ... A projection part (it serves as solder cost), 30 / ... The LCD fixed metallic-ornaments upper part 31 / ... The LCD fixed metallic-ornaments lower part 89 / ... It ****s and is 90. / ... A metal frame, 98 / ... Projector

equipment] ... A polarizing plate, 13-3a, 13-3b, 13-3c ... A light valve with a metal frame (liquid crystal display section), 13A ... The liquid crystal panel section, 13B

[Translation done.]